6.0 AIR QUALITY IMPACT ANALYSIS

INERT POLLUTANTS

An Air Quality Impact Analysis (AQIA)* is required when the following conditions are met:

1. Non-attainment pollutants (NSR Review).

   If that portion of a stationary source within APCD jurisdiction has a net emissions increase (NEI) greater than 5 pounds per hour but less than 10 pounds per hour, 240 pounds per day or 25 tons per year of non-attainment pollutants, an AQIA will be required which must show no violation or interference with attainment. In addition, if that portion of the stationary source within APCD jurisdiction has an NEI of greater than 10 pounds per hour, 240 pounds per day or 25 tons per year of non-attainment pollutants, an AQIA will be required to determine compliance with all ambient air quality standards.

2. Attainment Pollutants (PSD Review).
   An AQIA is required when:

   A. Project has components located within a Class 1 or Class 1 impact area and the NEI for that portion of stationary source within APCD jurisdiction is greater than 20 pounds per hour of CO or 5 pounds per hour for other attainment pollutants.

   B. The emissions from the entire stationary source is greater than 20 pounds per hour for an attainment pollutant. (Note that the emissions from the entire source, not the NEI is used for this determination.)

In A and B above, no ambient air quality standard can be exceeded.

<u>Location of Sources to be Included in AQIA</u>

To be included in the AQIA are all emissions from the stationary source. This includes facilities in the OCS and outside of Santa Barbara County which have the potential to impact Santa Barbara County air quality, and all facilities within the jurisdiction of the APCD.

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* The term AQIA is used in this document to mean Air quality Impact Analysis under NSR rules and "modeling" under PSD rules.

Sources to be included in the AQIA may be expanded if project conditions placed on the applicant by other regulatory agencies direct that other scenarios be examined by the APCD. Examples of additional issues for which analysis may be required include, but may not be limited to:

1. Air quality impacts from consolidated facilities.

2. Cumulative air quality impacts from proposed project and all reasonably foreseeable projects.

3. Air quality impacts from construction emissions.

4. Future specific throughput rates or levels of production not applied for by the applicant.

General Flow of AQIA:

1. Establish baseline air quality through minimum of one year of pre-construction monitoring (PCM).

2. Model to determine air quality impacts from the emissions of the proposed stationary source and source expansion emissions from permitted sources which were not operating at permitted capacity during the applicant's year of PCM.

Compliance with Ambient Air Quality Standards:

The results of the AQIA analyses are to be compared to all Local, State and Federal Ambient Air Quality Standards and increments.

Modeling Methodology for AQIA:

The following protocol is to be used for establishing air quality impacts for sources of emissions included in the AQIA.

INERT POLLUTANT MODELING METHODOLOGY:

I. Introduction

A. Models

For inert pollutant modeling, the models which are to be implemented are as follows:

COMPLEX-II:	For modeling inert pollutant impacts from all onshore point sources which impact terrain with elevation equal to or greater than the height of the lowest stack height.
MPTER:	For modeling inert pollutant impacts from all point sources which impact terrain with elevation less than the height of the lowest stack height.
TURNER FUMIGATION:	For modeling inert pollutant impacts under fumigation conditions from onshore and offshore point sources of emissions.
ISCST:	For modeling inert pollutant impacts from onshore non-point sources of emissions.
OCDCPM:	For modeling inert pollutant impacts from offshore sources and coastal (up to 1 km from shoreline) point sources associated with offshore sources of emissions.

Table 6-I-1 provides some generic project scenarios and the associated modeling requirements. The primary function of the Table is to show the differences between onshore and offshore sources. Onshore point sources (dependent upon terrain) require the use of either MPTER or COMPLEX II. The only exception to this requirement is if the onshore point source is directly linked to an offshore source (i.e., a processing plant onshore supplied by an offshore platform). Under this circumstance, OCDCPM can be used for both onshore and offshore sources. It must be noted that the onshore source in question must be within one kilometer of the shoreline to be modeled with OCDCPM. All onshore construction activities will be modeled with ISCST and summed with all concurrent point source emissions. Fumigation modeling will be executed for all pollutant sources except onshore construction activities. All offshore pollutant sources are considered point sources.

TABLE 6-I-1
GENERIC PROJECT SCENARIOS AND REQUIRED MODELING RUNS

	MPTER	COMPLEX II	OCDCPM	ISCST	FUMIGATION
Offshore point source	N/A	N/A	Required	N/A	Overwater version required
Onshore point source	Required according to receptor heights	Required according to receptor heights	N/A	N/A	Overland version required
Onshore point source* directly linked to offshore point source	N/A	N/A	Required	N/A	Both overland and overwater versions required
Onshore point source with concurrent offshore activity	Required for onshore source as above	Required for onshore source as above	Required for offshore activity **	N/A	Both overland and overwater versions required
Onshore construction activities	N/A	N/A	N/A	Required ***	N/A

NA = Not Available

* Onshore source within one kilometer of shoreline.

** Results will be summed with concurrent MPTER or COMPLEX II results.

*** Construction impacts will be summed with any other concurrent modeling results.

Additional Notes:

All offshore pollutant sources are considered point sources.

In order to assess cumulative air quality impacts from different source types, modeled pollutant concentrations from point sources and non-point sources which impact the same receptor during a given hour are to be summed together. This will require the use of a post-processor program and modification to the code of the model(s) used to output concentrations in a format acceptable to the post-processor. The District can provide information on this post-processor program and the required modification to the model(s) used.

In all instances fumigation modeling is to be performed in addition to the other modeling analyses prescribed in this protocol.

B. Source of Models

MPTER and ISCST are available from the National Technical Information Service (NTIS). MPTER and ISCST are part of a library of air quality simulation models titled "User's Network for Applied Models of Air Pollution - version 6" (UNAMAP 6) (USEPA, 1986).

Fumigation models are available from the California Air Resources Board (CARB). A document titled "Users Guide to the California Air Resources Board Air Quality Modeling Section Fumigation Models" is available free from the ARB which lists the codes and test cases for two fumigation models (Wagner, 1984). The Fumigation Model code is for assessing fumigation impacts from onshore sources, and the Coastal Fumigation Model code is for assessing fumigation impacts from offshore sources. The ARB will send a magnetic tape containing the two fumigation models to those requesting it for a handling fee. Fumigation models are also available from the District.

OCDCPM and COMPLEX II are available on magnetic tape from the District.

C. Submittals to APCD

Upon completion of the model runs, the applicant must provide the APCD on hard-copy and magnetic tape all material leading to and including the final output(s). This would include, but not be limited to, all input files, control files, output files, pre- and post-processor programs and their input, output and control files, and all models used. In short, supply all the information needed to duplicate the work submitted by the applicant. Tape format should be 9-track, ASCII, unlabeled, 1600 BPI, specified record length and 10 records per block.

II. Modeling of Point Source Emissions with COMPLEX-II

A. Option Specifications

Option Specifications: 0 = Don't Use Option

1 = Employ Option

OPTION		
	TECHNICAL OPTIONS	
IOPT (1)	Use Terrain Adjustments	1
IOPT (2)	No Stack Downwash	0
IOPT (3)	No Gradual Plume Rise	0
IOPT (4)	Use Buoyancy Induced Dispersion	1
	INPUT OPTIONS	
IOPT (5)	Met. Data is on Cards	0
IOPT (6)	Read Hourly Emissions	0
IOPT (7)	Specify Significant Sources	0
IOPT (8)	Input Radial Distances and Generate Polar Coordinate Receptors	0
	PRINTED OUTPUT OPTIONS	
IOPT (9)	Delete Emissions with Height Table	1
IOPT (10)	Delete Resultant Met. Data Summary for Avg. Period	1
IOPT (11)	Delete Hourly Contributions	1
IOPT (12)	Delete Met. Data on Hourly Contributions	1
IOPT (13)	Delete Final Plume Height and Distance to Final Rise on Hourly Contributions	1
IOPT (14)	Delete Hourly Summary	1
IOPT (15)	Delete Met. Data on Hourly Summary	1
IOPT (16)	Delete Final Plume Height and Distance to Final Rise on Hourly Summary	1
IOPT (17)	Delete Averaging - Period Contributions	1
IOPT (18)	Delete Averaging - Period Summary	1
IOPT (19)	Delete Average Concentrations and High-Five Table	0
	OTHER CONTROL AND OUTPUT OPTIONS	
IOPT (20)	Run is Part of a Segmented Long Run	0
IOPT (21)	Write Partial Concentrations to Disk or Tape	0
IOPT (22)	Write Hourly Concentrations to Disk or Tape	0
IOPT (23)	Write Averaging - Period Concs. to Disk or Tape	0
IOPT (24)	Punch Averaging - Period Concentrations on Cards	0
IOPT (25)	Complex Terrain Option	1

Discussion:

IOPT (25) does not apply to MPTER.

The above option specifications are those which should be used for submittal to the District. Should the applicant wish to employ option specifications other than those listed above which do not affect the concentration calculations, they may do so with proper notification of the District prior to making the modeling runs.

The actual height of wind speed measurement (anemometer height or ANHT) should be used as input. In most cases this will be 10 meters.
Exponents for power law wind speed increase with height are:
0.10, 0.15, 0.20, 0.25, 0.30, 0.30

Terrain Adjustments are:
0.5, 0.5, 0.5, 0.5, 0.0, 0.0

ZMIN is 10.0

With regard to the length of the air quality and meteorological data set to be used in the AQIA, the minimum data set will be the year of applicant pre-construction monitoring. In addition, the APCD may require that any other available air quality and meteorological data which are deemed appropriate be included as input in the AQIA.

B. Meteorology

Meteorological parameters required by COMPLEX-II are wind speed, wind direction, temperature, stability class and mixing height. Hourly wind speed, wind direction and temperature should at a minimum be obtained from the previously approved APCD pre-construction monitoring activities for the project in question. The pre-construction monitoring and other data used as input to the Air Quality Impact Analysis must be of at least one year duration. Stability class is to be obtained in a manner consistent with the EPA document "Guideline on Air Quality Models, Revised" (USEPA, 1986). Twice daily mixing heights are available from Pt. Mugu and Vandenberg. Hourly mixing heights can be estimated from pre-processing programs such as those available for CRSTER (USEPA, 1977). If twice daily mixing heights are not available, hourly mixing heights can be estimated from (Holzworth, 1972).

C. Source Parameters

For each source of pollutants modeled, the following inputs are required: source coordinates (UTM), emission rate, stack height, stack gas temperature, stack gas velocity and source elevation. All of these parameters must be reviewed by the APCD engineering staff prior to executing the model.

Maximum hourly emission rates are to be used for modeling averaging periods less than or equal to 24 hours.

Annual average emission rates are to be used for annual average concentration calculations.

Emission rates used as input to the models are to be the proposed emission increases from the stationary source. All emission increases from the source which have occurred or will occur after the pre-construction monitoring data are collected must be included. Additionally, emissions from other permitted sources which were not operating at permitted capacity at the time of pre-construction monitoring must be included in the modeling.

To the extent possible, offsets will be included in the AQIA. If the source(s) to be used as offsets were operating during the air quality pre-construction monitoring period, then the contribution of the offset source(s) to the background air quality values used in the AQIA may be considered for being "backed out" of the appropriate air quality background value. "Backing out" is to be considered only if it can be determined that the offset source(s) impacted the air quality monitor(s) during the time period when the background air quality value(s) used in the AQIA were measured. Contact District staff for guidance on this matter.

If the source(s) to be used as offsets were modified so as to incorporate offset emissions strategy during the year of pre-construction monitoring for air quality, then no further consideration on the incorporation of offsets in the AQIA is necessary.

D. Use of background Air Quality for Pollutants Other Than NO_2.

The values for background air quality for pollutants requiring modeling must be accomplished in the pre-construction monitoring phase of the project prior to performing the AQIA. Background air quality values will be added to project impacts for comparison to ambient air quality standards.

Background air quality is to be added to project impacts as follows:

1. Using the year of pre-construction monitoring meteorological data as input to the model, determine the maximum modeled concentration for each pollutant and averaging period in question.

2. Review the year of pre-construction monitoring air quality data to determine the maximum ambient air quality values measured for each pollutant and averaging period in question.

3. For each pollutant and averaging period, add the results of steps 1 and 2 to obtain the total pollutant concentration which is to be compared with ambient air quality standards.

E. Use of Background Air Quality for NO_2

The ozone - limiting method is to be used to convert modeled NO_x concentrations to NO_2 concentrations (Cole and Summerhays, 1979).

Procedure:

1. One-hour NO_2

   A. Using the year of pre-construction monitoring meteorological data as input to the model, determine the maximum one-hour NO_x concentrations (NOXMAX).

   B. Review the year of pre-construction monitoring air quality data to determine the maximum simultaneous hourly sum of ozone plus NO_2.

   C. Assume that ten percent of the NO_x emissions are in the form of NO_2 at the stack.

D. Compare the remaining NO_x (0.9 * NOXMAX) to the ozone concentration during the hour which contained the maximum sum of ozone plus NO_2. If the ozone concentration is greater than 0.9 * NOXMAX, then total conversion to NO_2 is assumed (NOXMAX = NO_2). If not, then the NO_2 concentration is set equal to the ozone concentration and added to the stack NO_2 portion.

```
IF (0.9 * NOXMAX .LE. CHIO3) THEN
   CHINO2 = NOXMAX

ELSE

   CHINO2 = 0.1 * NOXMAX + CHIO3

ENDIF
```

E. The calculated NO_2 concentration resulting from the source is then added to the NO_2 concentration during the hour which contained the maximum sum of ozone plus NO_2.

F. Compare the value obtained in E to the one-hour CAAQS for NO_2.

2. Annual NO_2

A. Using the year of pre-construction monitoring meteorological data as input to the model, determine the maximum annual NO_x concentration.

B. Assume 100 percent conversion of NO_x to NO_2.

C. Add the resultant NO_2 concentration obtained in B to the annual average ambient NO_2 value obtained from the applicant's year of pre-construction monitoring air quality data.

F. Receptor Grid Spacing

Receptor points shall be placed as follows:

1. At 250 meter intervals on a cartesian grid.

2. At specific discrete points to ensure that maximum potential impact is modeled (for example - on facility boundary line, or on sub-grid size terrain features). Receptor grid should be large enough in extent to cover region(s) of significant impact(s).

3. Receptors shall not be placed inside applicant's facility boundaries. Receptors are to be placed starting at discrete points along the facility boundary line or along an arc 100 meters away from the nearest source(s), depending on whichever distance is greater from the source(s) in question.

4. Receptor elevations are to be obtained from 7.5 minute USGS or more detailed topographic maps.

III. Modeling of Point Source Emissions with MPTER

The information which applies to COMPLEX-II also applies to MPTER, with the following exceptions:

1. MPTER is to be used for receptors which are at lower elevation than the lowest stack height being modeled.

2. IOPT (25) does not apply to MPTER.

IV. Fumigation Modeling

Fumigation modeling is also to be done for the CAAQS for one-hour NO_2 and one-hour SO_2.

Review the year of pre-construction monitoring meteorological data to determine examples of worst-case meteorology. All cases of E and F stability and low wind speeds (less than or equal to 3 meters per second) should be examined. Wind speeds too low to transport offshore sources to shore after 3 hours travel at that speed are to be increased to necessary speed to reach shore within 3 hours.

Use actual wind directions associated with the above cases.

Depending on source locations, use either or both of the ARB fumigation models discussed earlier (Wagner, 1984).

Use same source parameters, ozone - limiting method, and/or background air quality considerations as for COMPLEX-II/MPTER.

V. Modeling of Onshore Non-Point Source Emissions

A. General Information

This section outlines the Santa Barbara County Air Pollution Control District (District) protocol for modeling air quality impacts from onshore non-point source type emissions (volume and area sources). This protocol is specifically designed to be applicable to the following types of emission sources:

1. Onshore construction combustive emissions (NO_x, PM-10, SO_2, CO)

   a. Site preparation and grading

   b. Facility installation and assembly

   c. Pipeline right of way (ROW) preparation, trenching and installation

   d. All other combustive emissions prior to facility operation

2. Onshore construction fugitive emissions (PM-10)

   a. Site preparation and grading

   b. Facility installation

   c. Pipeline ROW preparation and trenching

   d. All other ground-disturbing activities

3. Onshore operational fugitive emissions (ROC, H_2S)

   This category includes fugitive emissions from valves, flanges, connections and any other venting of ROC to the atmosphere.

4. Onshore operational fugitive emissions (TSP, PM-10)

   a. Fugitive dust from excavation (mine pits), stockpiles and graded areas

   b. Fugitive dust from unpaved roadways and parking lots

   c. Fugitive dust from material transport - such as uncovered haul trucks, railways

d. Fugitive dust from material handling - such as uncovered conveyors, crushers, hoppers, screens, etc.

This protocol is designed to cover the majority of scenarios which are anticipated to be analyzed by the District. However, should a particular scenario include components which are not covered in this protocol, the District will determine the appropriate procedures to be used in the Air Quality Impact Analysis.

The air quality model to be used for the above identified scenarios is the Industrial Source Complex Short-Term model (ISCST). ISCST is to be used for all pollutants and for all averaging periods, including annual. This model is available from the National Technical Information Service (NTIS) as part of the library of air quality dispersion models titled "User's Network for Applied Models of Air Pollution - Version 6 (UNAMAP 6). ISCST is also available from the District.

B. ISCST Option Specifications

This section discusses the values to be specified for each option used by ISCST.

1. ISW Option Specifications:

Option	Option List	
1.	CALCULATE (CONCENTRATION=1, DEPOSITION=2)	ISW(1)=1
2.	RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)	ISW(2)=1 OR 3
3.	DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1, POLAR=2)	ISW(3)=1
4.	TERRAIN ELEVATIONS ARE READ (YES=1, NO=0)	ISW(4)=0 OR 1
5.	CALCULATIONS ARE WRITTEN TO TAPE (YES=1, NO=0)	ISW(5)=0
6.	LIST ALL INPUT DATA (NO=0, YES=1, MET DATA ALSO=2) COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION) WITH THE FOLLOWING TIME PERIODS:	ISW(6)=1
7.	HOURLY (YES=1, NO=0)	ISW(7)=1
8.	2-HOUR (YES=1, NO=0)	ISW(8)=0

Option (Con't)	Option List	
9.	3-HOUR (YES=1, NO=0)	ISW(9)=1
10.	4 HOUR (YES=1, NO=0)	ISW(10)=0
11.	6 HOUR (YES=1, NO=0)	ISW(11)=0
12.	8-HOUR (YES=1, NO=0)	ISW(12)=1
13.	12-HOUR (YES=1, NO=0)	ISW(13)=0
14.	24-HOUR (YES=1, NO=0)	ISW(14)=1
15.	PRINT 'N'-DAY TABLES(S) (YES=1, NO=0) PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE SPECIFIED BY ISW(7) THROUGH ISW(14):	ISW(15)=1
16.	DAILY TABLES (YES=1, NO=0)	ISW(16)=0
17.	HIGHEST & SECOND HIGHEST TABLES (YES=1, NO=0)	ISW(17)=1
18.	MAXIMUM 50 TABLES (YES-1, NO=0)	ISW(18)=1
19.	METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1, CARD=2)	ISW(19)=1 OR 2
20.	RURAL-URBAN OPTION (RURAL=0 URBAN MODE 1=1, URBAN MODE 2=2)	ISW(20)=0
21.	WIND PROFILE EXPONENT VALUES (DEFAULTS =1 USER ENTERS=2, 3)	ISW(21)=1
22.	VERTICAL POTENTIAL TEMPERATURE GRADIENT VALUES (DEFAULTS=1, USER ENTERS=2, 3)	ISW(22)=1
23.	SCALE EMISSION RATES FOR ALL SOURCES (NO=0, YES IS GREATER THAN 0)	ISW(23)=var.[1]
24.	PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1, NO=2)	ISW(24)=2
25.	PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2, NO=1)	ISW(25)=2
26.	PROGRAM USES BUOYANCY-INDUCED DISPERSION (YES=1, NO=2)	ISW(26)=2

Option (Con't)	Option List	
27.	PROGRAM USES A CALM WIND PROCESSING ROUTINE TO CALCULATE CONCENTRATIONS DURING CALM PERIODS (YES=1, NO=2)	ISW(27)=2
28.	PROGRAM SETS REGULATORY DEFAULT FEATURES (YES=1, NO=2)	ISW(28)=2
29.	PROGRAM ASSUMES SO_2 IS BEING MODELED (YES=1, NO=2)	ISW(29)=1 OR 2
30.	PROGRAM USES AN INPUT DEBUG MODE (YES=1, NO=2)	ISW(30)=1 OR 2
31.	NUMBER OF SOURCE GROUPS (=0, ALL SOURCES)	NGROUP=0
32.	TIME PERIOD INTERVAL TO BE PRINTED (=0, ALL INTERVALS)	IPERD=0
33.	SOURCE EMISSION RATE UNITS CONVERSION FACTOR	TK=.10000E+07
34.	ENTRAINMENT COEFFICIENT FOR UNSTABLE ATMOSPHERE	BETA1=0.600
35.	ENTRAINMENT COEFFICIENT FOR STABLE ATMOSPHERE	BETA2=0.600
36.	HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED	ZR=var.[1]
37.	LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA	IMET=5
38.	DECAY COEFFICIENT (0=DEFAULT)	DECAY=0
39.	ACCELERATION DUE TO GRAVITY (0=DEFAULT)	G=0
40.	SOURCE EMISSIONS OPTION	QFLG=0
41.	WIND SPEED CATEGORIES (0=DEFAULT)	UCATS=0

1 value varies with scenario simulated.

ISW(31)
Flow-vector specific building
widths + heights

DISCUSSION:

The above option specifications are those which should be used for submittal to the District. Should the applicant wish to employ option specifications other than those listed above which do not affect the concentration calculations, they may do so with proper notification of the District prior to making the modeling runs.

ISW(1): This option is to be set to 1 as only concentrations are to be calculated. No gravitational settling or deposition is to be considered.

ISW(2): This option can be set to 3 if the user wishes ISCST to create a portion of the receptor grid.

ISW(4): For modeling ground-based area and volume sources, ISW(4) is to be set to 0 with terrain elevations not read into the model.

For modeling elevated (non-ground based) volume sources, terrain elevations can be read into the model (ISW(4)=1 if the lowest effective height of emissions is greater than any of the surrounding terrain being modeled (Note: Since plume rise is not considered in ISCST for area and volume sources, the effective height of emissions is equivalent to the release height of the emissions). Terrain elevations less than the lowest effective height of emissions are to be unaltered, however, terrain elevations greater than or equal to the lowest effective height of emissions are to be set equal to 0.1 meter less than the lowest effective height of emissions. This approach provides for an offset distance between the plume and the surrounding terrain and prohibits the termination of execution of ISCST if the elevation of any receptor is greater than or equal to the effective height of emissions of any volume source. As an alternative, the elevated volume sources may be modeled as ground-based volume sources with terrain not read into the model.

Scenarios which contain both ground-based and elevated volume sources can be modeled separately and the results assumed cumulative. As an alternative, all of the volume sources may be modeled as ground-based volume sources with terrain not read into the model.

For modeling scenarios which contain only area sources, ISW(4) is to be set to 0 as ISCST does not consider terrain effects for area sources.

For modeling scenarios which contain both area and volume sources (either ground-based and/or elevated) terrain is to be considered as if the scenario contained only volume sources.

In all cases in which terrain is not read into the model (ISW(4)=0), the elevations of the sources above mean sea level (ZS) are to equal 0. In cases in which terrain is read into the model ISW(4)=1), the actual values of source elevation (ZS), effective height of emissions (HS) and the terrain elevations (GRIDZ(IJ) are to be input in meters. Again, all values of GRIDZ(IJ) must be less than the sum of ZS + HS for any source.

ISW(7) through ISW(15): For those averaging periods for which concentrations are required, specify the option as equal to 1.

ISW(19): This option can equal 1 or 2 depending on the format of the meteorological data input file.

ISW(23): This option is to be set to 3 if only certain hours of a day are to be modeled. Refer to Section D.1. (Hours of Operation and Averaging Period considerations) for method of application in conjunction with QTK. QFLG is to equal 0.

ISW(24) and ISW(25): These options do not affect area and volume sources.

C. ISC Modeling for Specific Source Types

ISCST has the ability to simulate three source types: point (stack), area and volume. The District, however, sanctions the use of ISCST only for non-point source emissions types.

For each source, the following parameters are required as input: emission rate, coordinates (UTM or relative to user origin), elevation of source above mean sea level, height of source of emissions above ground surface, initial vertical dimension (volume sources only) and initial horizontal dimension. Specific information on the appropriate source parameters is discussed in this section.

1. Volume Sources (ITYPE =1)

As a rule, sources with emissions containing an initial vertical extent are to be modeled as volume sources. The initial vertical extent may be due to plume rise or a vertical distribution of numerous smaller sources over a given area.

Emissions which are to be modeled as volume sources include those resulting from construction combustive activities (NO_x, PM-10, SO_2, CO) and operational fugitive emissions (ROC, TSP, PM-10) which emanate from numerous levels covering the same ground surface area.

a. Emission Rate (Q)

The emission rate for volume source emissions is to be specified in grams/second (g/s). The worst-case one-hour emission rate is to be used for all averaging periods, except for annual average which will utilize an annual average emission rate. All emission rates are to be calculated in a manner consistent with district approved procedures.

With respect to modeling combustive PM-10 emissions, the following PM-10/TSP ratios are to be used in the absence of more specific information (ARB, 1987):

i. Stationary IC engines - diesel: 0.96

ii. Stationary IC engines - gas: 0.99

iii. Vehicular Sources -diesel: 0.96

iv. Vehicular Sources - gas: 0.99

b. Height of Source Above Surface (HS)

i. Construction Combustive Emissions

Combustive emissions from construction activities are to be modeled as ground-based volume sources (HS=0).

ii. Operational fugitive Emissions

ROC fugitive emissions emanating from numerous levels covering the same ground surface area are to be modeled as a volume source, with the height of emissions (HS) being set equal to the lowest level of the ROC fugitive emissions.

c. Initial Vertical Dimension (SIGMA-Z0, input as TS)

i. Constructive Combustive Emissions

The vertical dimension of a ground-based volume source is to equal the mass emission weighted plume rise of all the combustive sources contained within the volume source being modeled. The vertical dimension of a ground-based volume source is to be calculated in the following manner:

1. Each individual source within the volume source being modeled is to be examined. Utilize either the MPTER, or COMPLEX-II model with IOPT(14), IOPT(15) and IOPT(16) set equal to 0. Refer to Section II.A. for the specification of the remaining model options. This specification of these options will provide the user with information on final plume height for each source. For ground-based volume sources, the final plume height is equal to the final plume rise. Final plume rise is to be used for the purposes of calculating the vertical dimension of the volume source.

2. To determine the mean plume rise from the individual sources in the volume source being modeled, the following anticipated reasonable worst-case meteorological conditions are to be utilized:

   F Stability class; 1.0 meter/second wind speed

   F Stability class; 1.5 meter/second wind speed

   F Stability class; 2.0 meter/second wind speed

   For each individual source contained in the volume source, the mean of the plume rises associated with the above meteorological conditioned is to be calculated.

   $$hm_i = (h_i(F, 1.0) + h_i(F, 1.5) + h_i(F, 2.0))/3$$

3. For each individual source contained in the volume source, the mean plume rise is to be weighted by the emissions rate of the source (in grams/second). This is to be done by multiplying the mean plume rise by the emission rate on a source-by-source basis.

   $$MWPR_i = hm_i * Q_i$$

4. Sum the products of mean plume rise and emission rate for each of the sources contained in the volume source.

$$\sum_{i=1}^{N} MWPRi$$

5. Sum the emission rates for each of the sources contained in the volume source.

$$\sum_{i=1}^{N} Q_i$$

6. To obtain the vertical dimension of a ground-based volume source, divide the quantity obtained in 4) by the quantity obtained in 5).

$$\frac{\sum_{i=1}^{N} MWPR_i}{\sum_{i=1}^{N} Q_i}$$

7. If the vertical dimension of the ground-based volume source is calculated to be greater than 10 meters, the value is to be set equal to 10 meters. In no instance is the vertical dimension of a volume source to exceed 10 meters.

The initial vertical dimension (SIGMA-Z0) for a ground=based volume source is then equal to the vertical dimension of the source specified by the user divided by 2.15.

4. Sum the products of mean plume rise and emission rate for each of the sources contained in the volume source.

$$\sum_{i=1}^{N} MWPRi$$

5. Sum the emission rates for each of the sources contained in the volume source.

$$\sum_{i=1}^{N} Q_i$$

6. To obtain the vertical dimension of a ground-based volume source, divide the quantity obtained in 4) by the quantity obtained in 5).

$$\frac{\sum_{i=1}^{N} MWPR_i}{\sum_{i=1}^{N} Q_i}$$

7. If the vertical dimension of the ground-based volume source is calculated to be greater than 10 meters, the value is to be set equal to 10 meters. In no instance is the vertical dimension of a volume source to exceed 10 meters.

The initial vertical dimension (SIGMA-Z0) for a ground=based volume source is then equal to the vertical dimension of the source specified by the user divided by 2.15.

ii. Operational Fugitive Emissions

The initial vertical dimension (SIGMA-ZØ) of the volume source representing operational fugitive emissions is to be equal to the vertical extent of the ROC fugitive emitting sources (not to exceed 1Ø meters) divided by 2.15.

d. Initial Lateral Dimension (SIGMA-YØ) input as VS

Rather than model construction emissions or other volume sources as one large volume source, the emissions are to be modeled as a larger number of smaller volume sources. The width of a volume source, X_o, is to be less than or equal to 5Ø meters in all cases. The value of the initial lateral dimension (SIGMA-YO) is to be equal to $x_o/4.3$.

2. Line Sources (ITYPE = 1)

Emissions resulting from construction combustive activities which occur in a relatively narrow corridor (such as pipeline trenching, pipeline ROW preparation and pipe handling) are to be modeled as line sources. Line sources are represented by a series of adjacent volume sources, the number of volume sources (N) being equal to the length/width of the line source.

a. Emission Rate (Q)

Specifics of line source emission rates are equivalent to those for volume sources. The distribution of emissions along the line source is to be determined by the construction activities being simulated.

b. Height of Base of Source Above Surface (HS)

Specifics of the height of the base of the source above the surface for line sources are equivalent to those for volume sources.

c. Initial Vertical Dimension (SIGMA-ZØ), input as TS

Specifics of the initial vertical dimensions for line sources are equivalent to those for volume sources.

d. Initial Lateral Dimension (SIGMA-YØ), input as VS

The width (X_o) of adjacent volume sources used to represent a line source is to be less than or equal to 5Ø meters in all cases. In most circumstances, the

the value of X_o for line sources will be on the order of 20 meters of less. The value of the initial lateral dimension (SIGMA-Y0) is to equal $X_o/2.15$ for adjacent volume sources used to represent a line source.

3. Area Sources (ITYPE=2)

Emissions which are to be modeled as area sources include fugitive emissions of PM-10/TSP and ROC. Area sources are characterized by non-buoyant emissions containing negligible vertical extent of release.

Fugitive particulate (PM-10, TSP) emission sources include areas of disturbed ground, which may be present during both the construction (clearing, grading, excavating) and operational (open pits, unpaved roads, parking lots) phases of a facility's life. Also included are areas of exposed material storage (stockpiles) and segments of material transport where potential fugitive emissions may occur (uncovered haul trucks or rail cars, emissions from unpaved roads). Fugitive emissions may also occur during stages of material handling where particulate material is exposed to the atmosphere (uncovered conveyors, hoppers and crushers).

Fugitive hydrocarbon (ROC) emissions emanating from a specific level are to be modeled as area sources. This may include fugitive emissions from valves, flanges, venting and other connections which occur at ground level or at an elevated level or deck if on a building or structure. Sources of fugitive ROC emissions with a vertical extent greater than one meter are to be modeled as volume sources.

a. Emission Rate (Q)

The emission rate for area sources is to be specified in grams per square meter per second ($g/s\text{-}m^2$). The worst-case one-hour emission rate is to be used for all averaging periods, except for annual average which will utilize an annual average emission rate. All emission rates are to be calculated in a manner consistent with District approved procedures.

With respect to modeling fugitive PM-10 emissions, a PM-10/TSP ratio of 0.64 is to be used in the absence of specific information (ARB, 1987).

b. Height of Source Above Surface (HS)

The height (HS) of the area source above the surface is to be specified as the height from which the emissions emanate. For example, all ground-based activities which result in fugitive emissions are to be modeled with HS equal to 0. In cases of modeling fugitive emissions as area sources which emanate from an elevated level or deck, the value of HS is to equal the height of the level or deck above the ground surface.

c. width of a Square Area Source (X_O, input as VS)

Rather than model area sources as one large area source, the emissions are to be modeled as a larger number of smaller area sources. The width of an area source, X_O, is to be less than or equal to 50 meters in all cases.

D. Scheduling and Averaging Period Considerations

1. Onshore Construction Combustive Emissions

a. Scheduling Methodology

For purposes of modeling air quality impacts from construction combustive emissions, construction activities are to be analyzed consistent with any operating limitation (enforced by permit conditions) which specify the period(s) of the year and/or hours of the day the construction activities are to occur. Should the scheduling of a particular construction scenario be unknown or should permit conditions limiting periods of construction not be in effect, the construction combustive activities are to be modeled as occurring 24 hours a day, 365 days a year. As an alternative, an applicant may agree to operating limitations to construct for specific hours of the day and /or periods of the year.

In order to provide a degree of potential construction scheduling flexibility to an applicant, a one-hour period both preceding and following the projected hours of construction is to be analyzed. Likewise, for proposed construction activities less than three months in duration, a one-month period both preceding and following the projected period of construction is to be analyzed. For proposed construction activities longer than three months in duration, a minimum two-month period both preceding and following the projected period of construction is to be analyzed. However, the entire period to be analyzed is not to exceed one year.*

As an example, construction activities which are projected to occur from 0700 through 1700 local standard time are to be modeled as 0600 through 1800 in the air quality impact analysis. This is equivalent to model input hours 7 through 18, with model input hour 7 equaling the interval from 0600 to 0700. It is important to model all construction activities consistent with local standard time as the meteorological data input into ISCST is based on this time scheme. To continue this example, construction activities which are projected to occur from 1 February through 1 August are to be analyzed using the meteorological data from the period 1 December through 1 October.

b. Modeling Methodology and Averaging Period Considerations

Modeling air quality impacts for all averaging periods from construction combustive emissions occurring during specific hours of the day or periods of the year can be accomplished in the following manner:

i. Utilize the period of pre-construction monitoring (PCM) meteorological data determined per the scheduling method presented in Section D.1.a.

ii. Specify ISW(23)=3 in the input option list.

iii. Specify QFLG=0 in the input option list.

iv. For parameter QTK of the input option list, apply a scalar value of 1.0 for all hours of potential construction activity as determined per the scheduling method presented in Section D.1.a. (example: Hours 7 through 18) and apply a scalar value of 0.0 for all remaining hours.

* The one year period is not necessarily a calendar year, but is the running year during which the maximum construction emissions would occur.

The annual average concentration from construction activities which are conditioned to occur for less than a one-year period is to be calculated by multiplying the average concentration for the number of days of meteorology modeled (calculated by ISCST when ISW(15)=1) by the number of days in the construction period analyzed (as determined by the scheduling method presented in Section D.1.a) and dividing by 365.

In some instances, there may be several distinct construction activities occurring at a single site during a one-year period which are conditioned to not occur simultaneously. In these instances, each construction activity is to be analyzed with the schedule determined per the scheduling methodology presented in Section D.1.a. Should separate construction activity analyses overlap due to consideration of the one-month period preceding and following the conditioned activity, then the analyses are to be performed separately with the period of time beyond the period of conditioned activity being split equally so as to not result in modeled overlap between scenarios. Short-term (less than or equal to 24 hours) averaging periods are to be obtained directly from the modeling results of each construction activity. The annual average is then obtained by summing the scaled "annual average" impact from each separate construction activity. The annual average impact is not necessarily a calendar year, but is the running year during which the maximum construction impacts would occur.

2. Onshore Construction Fugitive Emissions

Fugitive dust emissions occurring as a result of construction activities are to be modeled consistent with the protocol for construction combustive emissions except that the fugitive emissions are to be modeled for all 24 hours of the day. This is consistent with the district protocol of calculating average fugitive dust emissions based on a 24 hour day which includes periods of active construction as well as periods of inactivity. ISW(23) and QFLG are to be both specified as Ø and QTK is not to be specified.

3. Onshore Operational Fugitive Emissions (ROC)

Operational fugitive ROC emissions are assumed to be constant and not a function of time of day. ISW(23) and QFLQ are to be both specified as 0 and QTK is not to be specified. Air quality impacts for all averaging periods are to be modeled using the entire year of pre-construction monitoring (PCM) meteorological data.

4. Onshore Operational Fugitive Emissions (TSP, PM-10)

Those emissions which are independent of the operational schedule of the facility are to be modeled in the same manner as fugitive ROC in 3 above. This may include fugitive dust from stockpiles, excavations, graded areas, etc. Emissions which are dependent upon facility operation, such as those from conveyors, crushers, etc., are to be modeled in the manner of the construction emissions in Section 1.a above, with the assumption that the facility is in operation 365 days a year.

E. Meteorology

Hourly meteorological inputs required by ISCST are wind speed, flow vector (direction <u>toward which</u> the wind is blowing (for both ISW(19)=1 and 2), <u>temperature,</u> stability class, and mixing height. The user should not input the hourly wind profile exponent and vertical potential temperature gradient, but should use the internal default values by specifying both ISW(21) and ISW(22) as 1 in the input option list.

for informational purposes, the default wind profile exponents a a function of stability class are:

.10, .15, .20, .25, .30, .30

and the default vertical potential temperature gradients as a function of stability class are:

0., 0., 0., 0., .02, .035.

Hourly wind speed, wind direction and temperature are to be obtained from previously approved APCD pre-construction monitoring. It is important to note that the direction <u>from</u> which the wind is blowing must be reversed 180 degrees to conform with the average flow vector (the direction <u>toward</u> which the wind is blowing). Stability class is to be obtained in a manner consistent with EPA document" Guideline on Air Quality Models (Revised)," July, 1986 (USEPA, 1986). Twice daily mixing heights are available from Pt. Mugu and Vandenberg. If unavailable, hourly mixing heights can be estimated from (Holzworth, 1972).

1. Calm Scenarios

   a. All wind speeds less than 1 m/sec must be converted to 1 m/sec prior to input to the ISCST model.

   b. The CRSTER pre-processor, which may be utilized, deals with calm winds (hourly mean wind speed approaching 0) in the following manner:

      i. wind speeds less than 1 m/sec are set equal to 1 m/sec.

      ii The wind direction is set equal to the value for the last non-calm hour.

F. Background Air Quality

To assess one, three and eight-hour background air quality values for construction activities which occur for only a portion of the day, use the observed background air quality only for the hours of construction activities which were modeled. Likewise, to model construction activities which occur for only a portion of the year, use the observed background air quality only for the portion of the year during which construction activities were modeled. Twenty-four hour average background air quality values are to be selected from the portion of the year during which the construction activities were modeled. Annual average background air quality values are to be obtained from the year of PCM ambient air quality data collected by the applicant. Otherwise, the protocol included in Sections 6.II.D. and 6.II.E. of the District's Permit Processing Manual are to be used.

G. Receptor Grid Spacing

Receptor points shall be placed as follows:

1. At 250 meter intervals on a cartesian grid.

2. At specific discrete points to ensure that maximum potential impact is modeled (for example, on facility boundary line). The receptor grid should be large enough in extent to cover region(s) of significant impact(s).

3. Receptors shall not be placed inside applicant's facility boundaries. Receptors are to be placed starting at discrete points along the facility boundary line or along an arc 100 meters away from the nearest source(s) (or $X_o/2$ + 100 meters away from the nearest area source(s)) depending on which distance is greater from the source(s) in question.

4. Refer to discussion of ISW(4) for specifics of terrain considerations. If terrain elevations are to be utilized, they are to be obtained from 7.5 minute USGS or more detailed topographic maps.

H. Modifications

In order to assess cumulative air quality impacts from different source types, modeled pollutant concentrations from point sources and non-point sources which impact the same receptor during a given hour are to be summed together. This will require the use of a post-processor program and modification to the ISCST code to output concentrations in a format acceptable to the post-processor program and the required modification to ISCST.

VI. Modeling of Offshore and Associated Coastal Source Emissions

A. General Information

This section outlines the Santa Barbara County Air Pollution Control District (District) protocol for modeling inert pollutant air quality impacts from offshore sources and coastal (i.e., within 1 km) point sources which are directly associated with offshore sources of air emissions. The air quality model presented in this section is OCDCPM, which may be used for sources in these situations.

The OCDCPM model is to be used for all inert pollutants and all averaging periods. OCDCPM is available on magnetic tape from the District.

This protocol is designed to cover the majority of scenarios which are anticipated to be analyzed by the District. However, should a particular scenario include components which are not covered in this protocol, then the District will determine the appropriate procedures to be used in the Air Quality Impact Analysis.

1. Model Description

The OCDCPM model is a hybrid of the Offshore and Coastal Dispersion (OCD) model (Version 3.0, as updated in January 1986) developed by the Minerals Management Service (MMS), and the Environmental Protection Agency's (EPA) COMPLEX-I and MPTER models. OCD was developed for use with offshore sources. COMPLEX-I and MPTER are EPA UNAMAP models for multiple sources in complex and simple to rolling terrain, respectively.

The OCDCPM hybrid model was developed by the District with technical guidance from EPA Region IX and the California Air Resources Board. The model uses the OCD algorithm to accomplish dispersion from offshore sources. At the shoreline, the OCD dispersion is continued for receptors at or below the lowest stack height. For receptors located above the lowest stack height, a transition to the COMPLEX-I dispersion and terrain algorithms is accomplished at the shoreline using a virtual point source treatment. In addition, a calculation is performed for above stack receptors using the OCD algorithm. For these complex terrain receptors, the higher of the OCD and OCD/COMPLEX-I calculations is retained and reported as the impact.

For onshore sources, the OCDCPM model reduces to MPTER for receptors located at or below the lowest stack height, and reduces to COMPLEX-I for above stack receptors. The OCDCPM model chooses and utilizes the appropriate EPA recommended model in each case based on source location (onshore or offshore) and receptor elevation with respect to the lowest stack height.

2. Applicable Source Types

The OCDCPM model is applicable to coastal projects which include offshore sources of air emissions. For example, an oil development project that included emissions from one or more offshore platforms, associated mobile sources such as tankers or supply boats, and coastal processing facilities would use the OCDCPM model for all offshore emissions and for all onshore point source emissions. Offshore mobile sources, such as vessels and barges, are to be simulated with OCDCPM as a series of point sources covering the expected area of emissions during each applicable averaging period. Fugitive hydrocarbon emissions from offshore sources are also to be simulated as multiple point sources covering the expected area of emissions.

Onshore non-point (area, line, or volume) sources, such as those produced by construction activities or fugitive emissions, should be modeled with the ISCST model (see Section 6-V of this manual). Onshore projects which do not include offshore emission sources should model point source emissions using either COMPLEX-II or MPTER, depending on the terrain height in the impact area (see Sections 6-II and 6-III of this manual). In addition, fumigation conditions are also to be modeled for both onshore and offshore sources to assess project compliance with the one-hour NO_2 and SO_2 California Ambient Air Quality Standards (CAAQS) (refer to Section 6-IV of this manual).

3. Specifications for District Submittals

All Air Quality Impact Analyses performed for the proposed project utilizing the OCDCPM model shall calculate the maximum impact value as the peak modeled impact value, from the combined onshore and offshore contributions, plus 20 percent of the peak modeled impact value (peak value x 1.2) to adjust for observed under predictions associated with the individual models used in this approach. It is important to note that OCDCPM does not include an algorithm to multiply the peak modeled concentration by 1.2; this must be done by the user as a post-processing exercise.

B. OCDCPM Model Input Requirements

This section discusses principal model input requirements. For additional information, refer to Sections 6-II and 6-III of this manual, and to OCD and MPTER documentation (Hanna, et al., 1984; Pierce and Turner, 1980).

1. Main Model (IOPT) Option Specifications

Table 6-VI-1 lists the major model options to be used in simulations with OCDCPM. The listed specifications should be used for all submittals to the District. Should the applicant wish to employ option specifications other than those listed which do not affect the concentration calculations, they may do so with proper notification of the District prior to submission of modeling results.

IOPT (1) through IOPT (24) have the same specifications as in the COMPLEX-II, and MPTER models.

IOPT (25) should be set to one (1) in all cases, which will enable the model to read the additional overwater meteorological data (refer to Section 6-VI-D.1.b. of this manual for a discussion of the overwater meteorological data set).

IOPT (26) should be set to zero (Ø) (no pollutant decay rate) and IOPT (27) should also be set to zero (Ø) (do not adjust reflection factor for sloping terrain). IOPT (27) only affects calculations using the OCD terrain algorithm.

IOPT (28) is the complex terrain option. This parameter is the same as IOPT (25) in the COMPLEX-II model and should be set to one (1) in all cases.

2. Overland Wind and Terrain Options

This section of the model input stream requires information concerning the onshore anemometer height, the surface roughness length, terrain adjustment factors, the minimum height of the plume above terrain, the latitude of the source region, and wind profile exponents.

The actual height at which the wind data used in modeling were taken should be specified as the anemometer height (HANE).

Surface roughness lengths (ZOL) for various types of terrain are listed in Table 6-VI-2. A weighted average roughness length for the source/receptor area should be used based on the distribution of terrain and vegetation types.

The following terrain adjustment factors (CONTER) should be used for stability classes A through F, respectively:

Ø.5, Ø.5, Ø.5, Ø.5, Ø.Ø, Ø.Ø

The minimum height of the plume above terrain (ZMIN) should be set to 1Ø.Ø meters.